

[54] METHOD FOR APPLYING, STITCHING AND SEVERING A TAPE ON A BODY

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[21] Appl. No.: 280,195

[22] Filed: Jul. 6, 1981

Related U.S. Application Data

[62] Division of Ser. No. 133,634, Sep. 11, 1979, Pat. No. 4,295,916.

[51] Int. Cl.³ B29H 17/00

[52] U.S. Cl. 156/117; 156/130; 156/184; 156/250; 156/397; 156/410; 156/413; 156/421; 156/494; 156/495; 156/510; 156/130.3; 156/405.1

[58] Field of Search 156/117, 130, 184, 187, 156/195, 250, 397, 405 P, 405 R, 410, 411, 413, 421, 494, 495, 510; 242/75.4, 156.1; 225/3, 100, 101, 106

[56] References Cited

U.S. PATENT DOCUMENTS

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4,105,488	8/1978	Hayes et al.	156/405 R

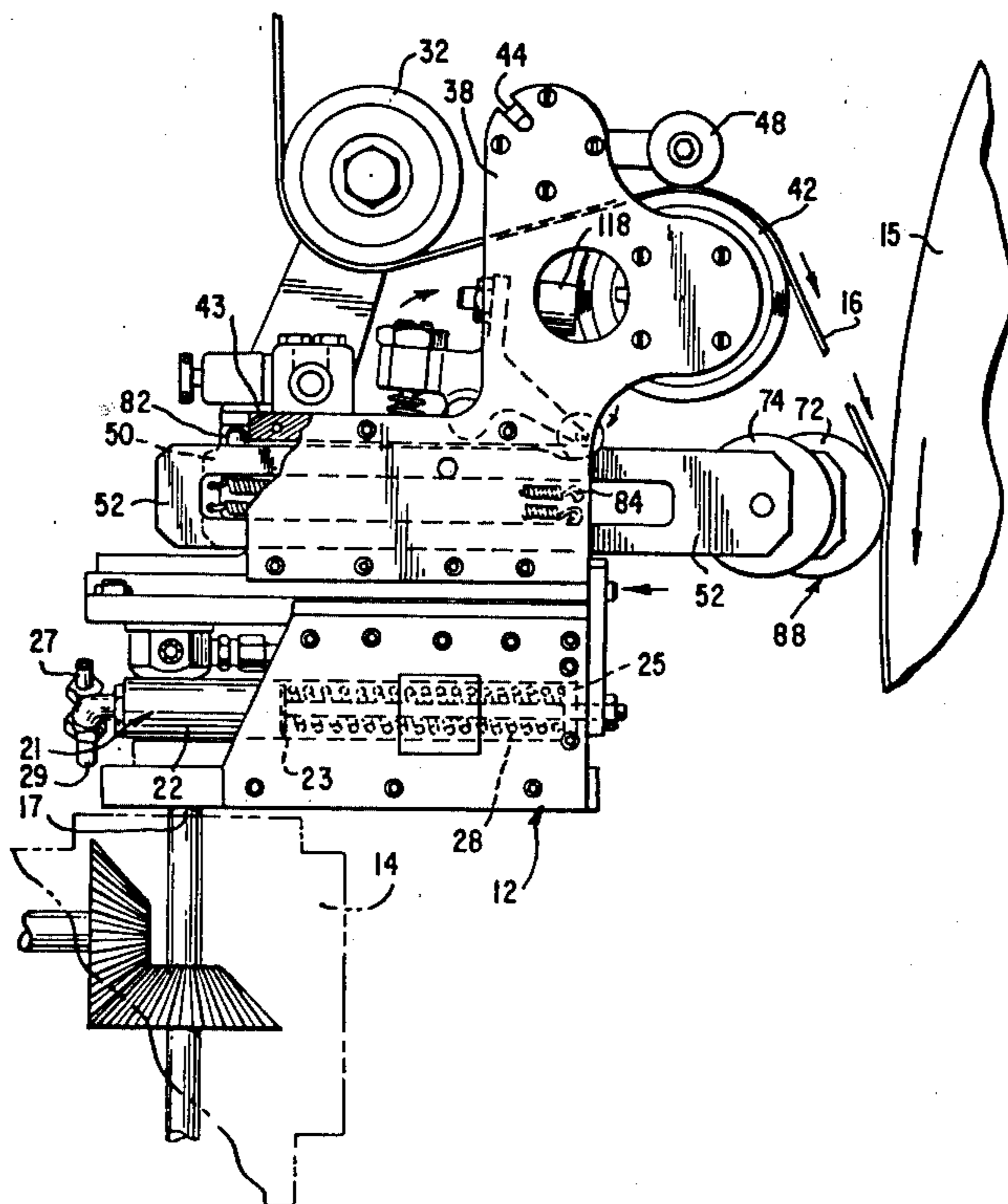
Primary Examiner—Caleb Weston

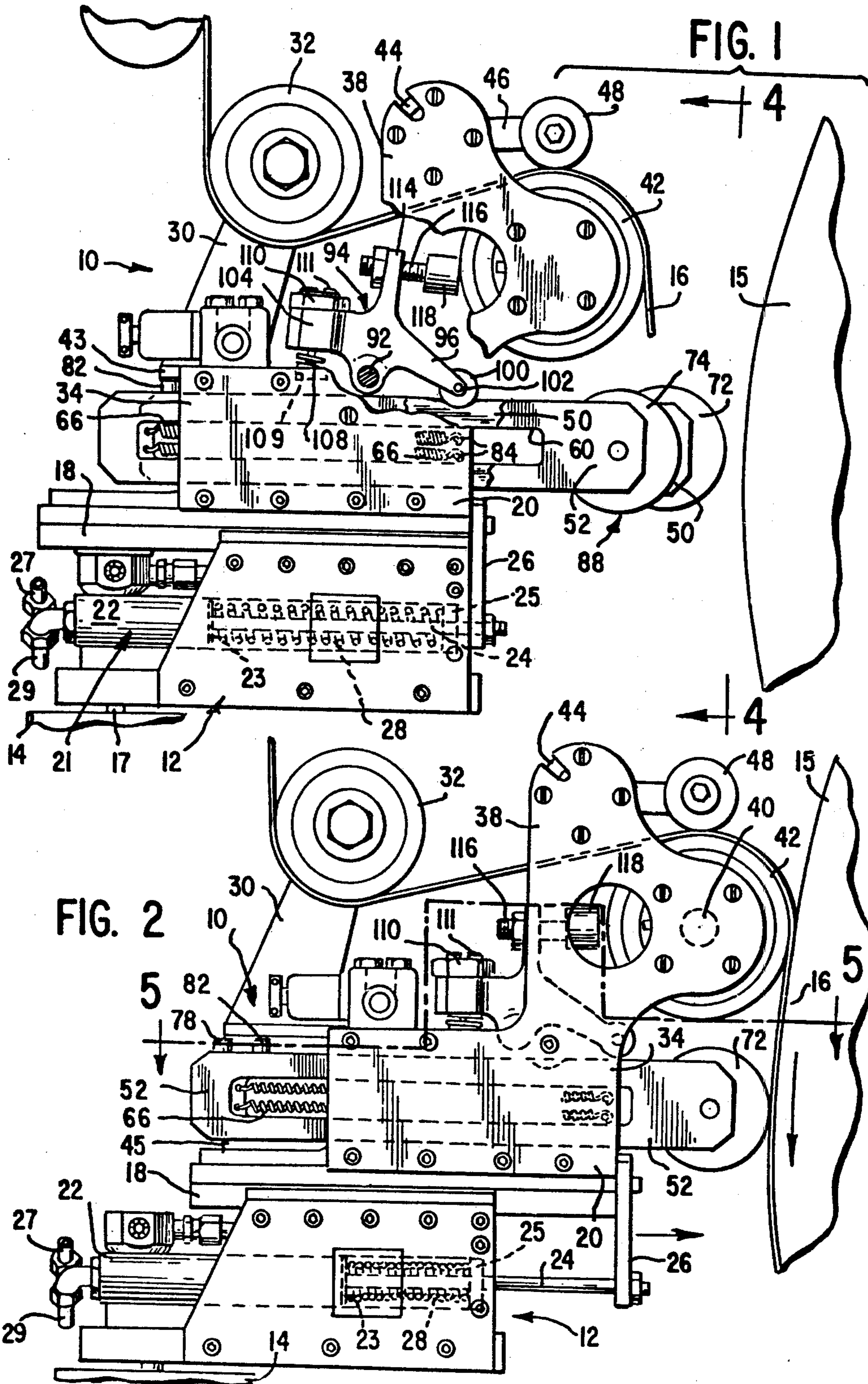
Attorney, Agent, or Firm—Wegner, Stellman, McCord, Wiles & Wood

[57] ABSTRACT

A tape-applying apparatus (10) is advanced toward a body (15) upon which a strip of tape (16) is to be applied to urge a plurality of stitching rollers (72,74) against the body (15). Further advancing of the apparatus (10) will move an applicator roller (42) and the end of the tape (16) into engagement with the body (15). As the body (15) is moved past the tape-applying apparatus (10), the tape (16) is pulled over the applicator roller (42) and is stitched to the body (15) by the stitching rollers (72,74). When sufficient tape (16) has been applied, the housing (20) of the tape-applying apparatus (10) is urged away from the body (15) which moves the applicator roller (42) out of contact with the body (15). A brake apparatus (94) on the housing (20) is activated by a cam recess (80) on the holders (50) for some of the stitching rollers (72). The brake apparatus (94) engages the applicator roller (42) to arrest further feeding of tape (16) to the body (15). Continued rotation of the body (15) with some of the stitching rollers (72) in contact therewith will stretch the tape (16) between the applicator roller (42) and the stitching rollers (72) until the tape (16) is severed. The free end of the tape (16) is left in position on the applicator roller (42) ready for the next application to the same or a different body (15).

6 Claims, 7 Drawing Figures





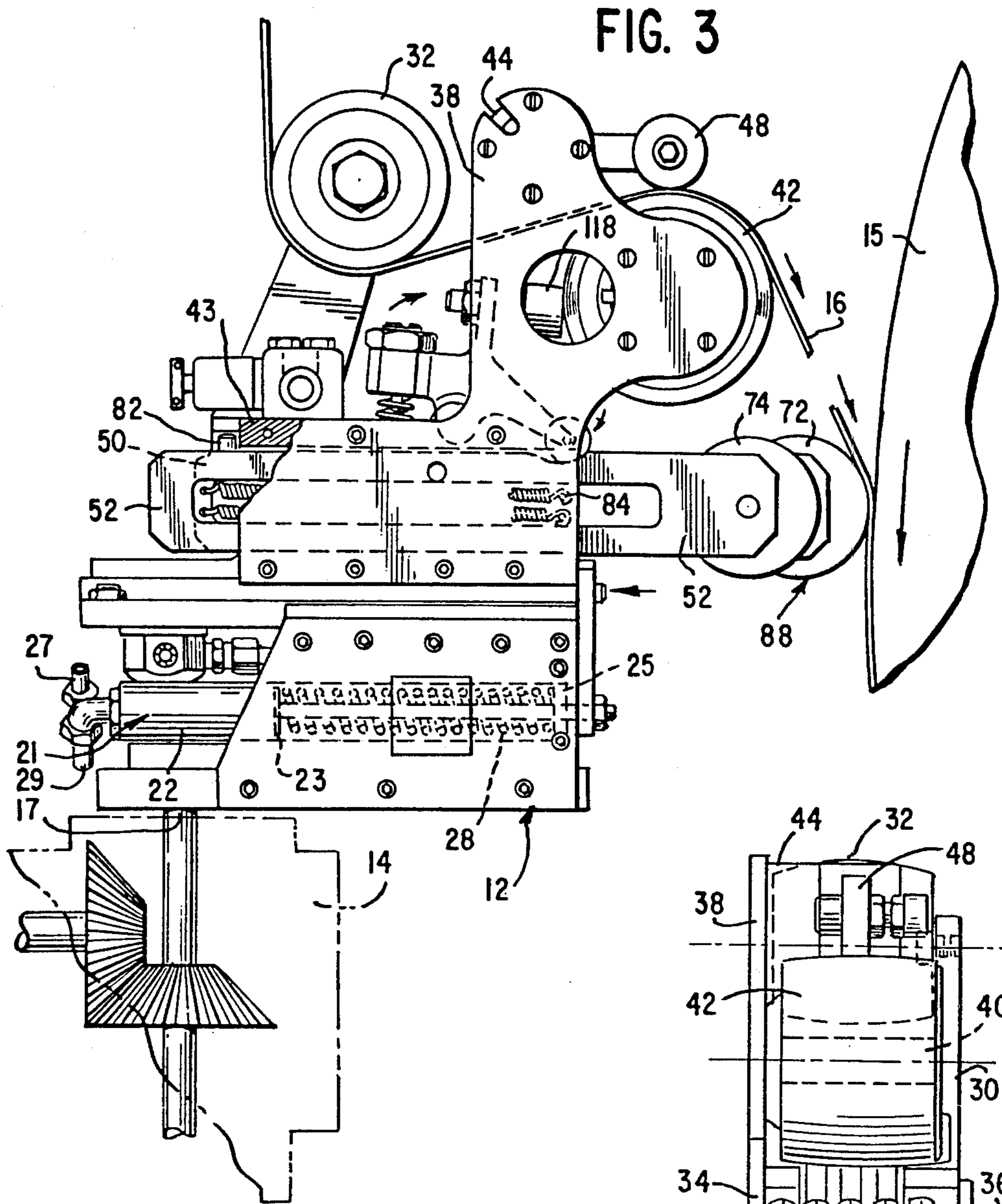
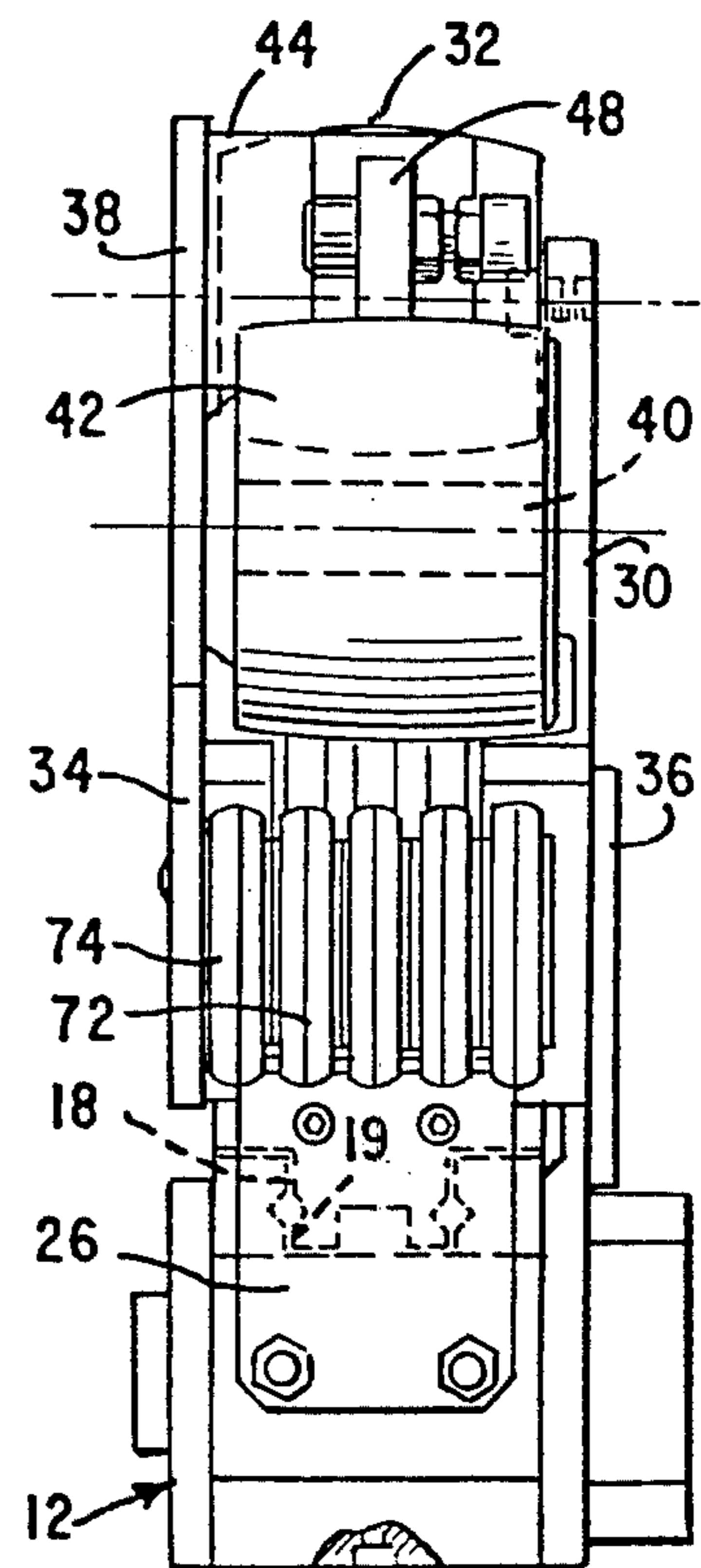


FIG. 4



METHOD FOR APPLYING, STITCHING AND SEVERING A TAPE ON A BODY

This is a division, of application Ser. No. 133,634 filed 5
Sept. 11, 1979, U.S. Pat. No. 4,295,916.

DESCRIPTION

1. Technical Field

This invention relates to a method for applying a tape 10
to a body and, more particularly, to a method for auto-
matically applying, stitching and then severing the tape.

2. Background Art

In the manufacture of tape-wound toroidal bodies, 15
such as tires and the like, a large amount of manual labor
is still required particularly in starting and stopping the
application of each layer of tape on the body. One such
problem prevails in the application of a tape of rubber to
a toroidal carcass wherein the tape is initially hand held
to the carcass until the applicator and stitching head 20
takes over to apply the desired amount of material. At
the conclusion of the application of the tape, the equip-
ment is shut down and the tape is manually severed and
the free end tacked to the carcass.

One device shown in U.S. Pat. No. 3,717,529, which 25
issued to W. L. Rattray et al on Feb. 20, 1973, discloses
an apparatus for automatically advancing an applicator
head for applying an end of a tape to the carcass after
which the carcass is rotated to start to wrap the tape on
the carcass. The applicator head is retracted from the 30
carcass and guides the tape to stitching rollers for ap-
plying and stitching the tape to the carcass. A brake is
actuated by a signal to stop rotation of the applicator
head whereupon the continued rotation of the carcass
under the stitching rollers stretches the tape between 35
the stitching rollers and the applicator head until it
breaks. The free end of the tape connected to the source
of the tape drapes over the applicator head ready for the
next application of tape to the same carcass or to a
different carcass.

Applying the tape to the carcass using only the stitch- 40
ing rollers may not produce a one-hundred percent
bubble free or fully stitched tape onto the carcass. Ap-
plying the brake to the applicator head relies on a signal
which may or may not be triggered in a timely fashion 45
so that the tape is severed at a less than optimum loca-
tion which may necessitate hand work to correct.

DISCLOSURE OF INVENTION

The present invention is directed to overcoming one 50
or more of the problems as set forth above.

In one aspect of the present invention, a method of
applying tape to a body uses a tape-applying apparatus
which is provided with an applicator head to automati- 55
cally tack a free end of a tape to a body which is rotat-
ing past the engaged applicator head. A stitcher assem-
bly follows the applicator head to continually stitch the
predetermined layer or layers of tape to the body. The
applicator head and the stitcher assembly remain in
contact with the body. At the conclusion of the applica- 60
tion, the apparatus retracts from the body so as to sepa-
rate the applicator head from the body with at least a
portion of the stitcher assembly still in stitching contact
with the body. A brake is provided which is activated
by the relative movement between the applicator head 65
and the stitcher assembly, whereby the brake engages
the applicator head to stop rotation of the applicator
head. The length of tape between the applicator head

and the stitcher head is stretched until it breaks with the
free end of the tape, that is connected to the source of
the tape, draping over the applicator head ready for the
next application of tape to the same or to a different
body.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an elevational view of a tape-applying appa-
ratus including an applicator head and stitcher assembly
with the improved brake-applying apparatus for the
applicator head;

FIG. 2 is an elevational view similar to FIG. 1 only
with the applicator head and stitcher assembly in opera-
tive tape-applying contact with a body;

FIG. 3 is an elevational view similar to FIG. 1 only
with the applicator head retracted and the stitcher as-
sembly partially retracted so that the tape is just break-
ing;

FIG. 4 is a view taken along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged view taken along the line 5—5
of FIG. 2;

FIG. 6 is an enlarged elevational view of one holder
of the stitcher assembly; and

FIG. 7 is an enlarged elevational view of a second
holder of the stitcher assembly.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring to FIG. 1 of the drawings, a tape-applying
apparatus 10 is shown slidably mounted on a cross slide
assembly 12 which is pivotally mounted on the end of a
support arm 14. The support arm 14 is manipulated to
position the cross slide assembly 12 and the tape-apply-
ing apparatus 10 in close proximity to a body 15 to
which the tape 16 is to be applied. Since the structure
and operation of the support arm 14, the pivot 17, and
the cross slide assembly 12 relative to the body 15 are
well known in the art, no detailed description thereof
will be made in this disclosure. Suffice it to say, the
support arm 14 locates and orients the cross slide assem- 40
bly 12 and the tape-applying apparatus 10 at an appro-
priate location relative to the body 15 and moves back
and forth across the tread area and the side walls of the
body 15 during the application of the tape 16 so as to
apply a layer or layers of tape 16 to the body 15 in a
predetermined manner.

The cross slide assembly 12 and the housing 20 of the
tape-applying apparatus 10 have interfitting guides 18,
FIG. 4, carried by the housing 20 and tracks 19 in the
top wall of the cross slide assembly 12 which slidably
coact to permit the housing 20 to move back and forth
relative to the cross slide assembly 12. A typical guide
and track assembly is marketed by The Bendix Corpora-
tion as a Schneeberger NK3-105 top (guide 18) and
NK3-180 base (track 19). A fluid actuator 21 is mounted
on the cross slide assembly 12 and includes a cylinder 22
in which is slidably mounted a reciprocating piston 23.
An actuator rod 24 is connected to the piston 23 and
extends from the cylinder 22 along an axis substantially
parallel to the axis of the guides 18 and tracks 19. The
actuator rod 24 is connected to a plate 26 which is se-
cured, as by bolts, to the lower front of the housing 20
so that admitting fluid to the cylinder 22 through inlet
27 will move the piston 23 and extend the actuator rod
24 to move the tape-applying apparatus 10 along the
tracks 19 on the cross slide assembly 12. A spring 28 is
positioned in the cylinder 22 and encircles the rod 24.
The spring 28 bears against the piston 23 and against the

end wall 25 of the cylinder 22 so that exhausting the cylinder 22 through outlet 29 will permit the spring 28 to move the actuator rod 24 and the tape-applying apparatus 10 away from the body 15.

A bracket 30, as can be seen in FIGS. 1 and 4, is secured to and extends up from the one side of the cross slide assembly 12 to support a transposition roller 32 above the tape-applying apparatus 10. The transposition roller 32, being mounted on the cross slide assembly 12, will move with the cross slide assembly 12 to guide the tape as it is received from a source of supply, not shown. The tape 16 will exit the roller 32 along an established path as it is directed toward the body 15 no matter how the tape-applying apparatus 10 and the cross slide assembly 12 are oriented with respect to the support arm 14. As an example, assuming that the tape 16 is a strip of rubber to be applied to a tire body or carcass, the strip will be supplied from an extruder, not shown, and will exit roller 32 in an established path.

The tape-applying apparatus 10 has the housing 20 comprised of a pair of spaced apart side plates 34 and 36 secured thereto with plate 34 having an upwardly extending arm 38 for supporting, in a cantilever fashion, an axle 40 about which an application roller 42 is rotatably mounted. A thickness transducer 44 is mounted on the arm 38 and has an arm 46 extending from the transducer 44 and supporting a feeler roller 48 in contact with the applicator roller 42 or in contact with the tape 16 passing between the applicator roller 42 and the feeler roller 48. The thickness transducer 44 is connected to a programmed control to sense when the tape 16 is too thick or too thin whereupon the controls will signal the source of the tape, such as the extruder or the like, to automatically decrease or increase the thickness of the tape 16 until it is within the tolerable limits.

Slidably mounted between the side plates 34, 36 and between a top plate 43 and a bottom plate 45 of the housing 20 of the tape-applying apparatus 10 is a plurality of slide holders 50 and 52, which slide holders are shown in detail in FIGS. 5, 6 and 7. In the present embodiment, three holders 50 are juxtaposed with respect to each other and are positioned between two spaced apart holders 52. The slide holders 50 and 52 are comprised of an elongate body portion 54 and 56, respectively, with elongate slots 58 and 60 cut throughout substantially the length of said body portions 54 and 56. At one end of each slot 58 and 60, a retaining web 64 is provided which has two vertically spaced openings for receiving one end of a pair of springs 66. The springs 66 are nested in the slots 58 and 60 and have their opposite ends anchored to a pair of pins 84 extending from one side plate 34 to the other side plate 36. The pins 84 extend through the elongate slots 58, 60 in the holders 50, 52, respectively. The forward or extended end portions 68 and 70 of the holders 50 and 52, respectively, are bifurcated, as viewed in FIG. 5, and receive stitching rollers 72 and 74 pivotally mounted about pivot pins 76 passing between the arms of the bifurcated portions 68 and 70. Each slide holder 50 has an upwardly extending stop lug 78 on the upper edge of the body portion 54 and positioned close to the one extremity of the holder, said extremity being spaced from the end of the holder supporting the roller 72. Each holder 50 also has a camming recess 80 formed in the upper edge of the body portion 54 thereof, said camming recesses 80 being transversely aligned with each other when the rollers 72 are transversely aligned. Each holder 52 has an upwardly extending stop lug 82 on the upper edge of the

body portion 56 and positioned inboard a distance in excess of the spacing of the stop lug 78 from the end of holder 50.

As can be seen in FIG. 5, holders 52 comprise the two outboard holders and holders 50 comprise the three inboard holders. When the extremities of the five holders 52, 50, 50, 50, 52 are aligned, the stop lugs 78 on the holders 50 are spaced longitudinally from the stop lugs 82 on the holders 52. The springs 66, between the holders 50, 52 and the housing 20, are all loaded so as to urge the holders 50 and 52 outward or to the right of the housing 20, as viewed in FIGS. 1 through 3. In FIG. 1, the springs 66 have urged the holders 50 and 52 to the right so that all five stop lugs 78 and 82 are in alignment with each other and engage the edge of the top plate 43 of the housing 20, the contact with the top plate 43 being shown in FIG. 3. The five holders 50 and 52, with the rollers 72 and 74 form the stitcher assembly 88 for the tape-applying apparatus 10.

A brake assembly 94 is pivotally mounted about a pivot 92 extending between brackets 93 on the top plate 43 of the housing 20. The brake assembly 94 is comprised of a forwardly extending plate 96 which has three cutouts 98 in the forward edge thereof, FIG. 5, in which cutouts 98 are rotatably mounted three cam rollers 100. The cam rollers 100 are retained in the cutouts 98 by means of a pin 102. The brake assembly 94 has an arm portion 104 extending from the pivot 92 in a direction opposite to the direction of plate 96. The arm portion 104 has three threaded openings 106, in each one of which is positioned a spring 108. The lower ends of the springs 108 nest in three sockets 109 formed in the top plate 43 of the housing 20. A lock nut 110 is threaded on a threaded pilot member 111, which pilot member 111 is threaded in opening 106 and bears on the springs 108 for adjusting the loading on the springs 108. Extending upwardly from the pivot 92 at the junction between the plate 96 and the arm portion 104 is a tang 114 which has a member 116 threaded through a threaded opening 115 therein. A resilient braking member or block 118 is mounted on an extended end of said member 116. A lock nut 120 is threaded on the member 116 and bears against the tang 114 for locking the forward surface of the braking member or block 118 in position relative to the brake assembly 94. The springs 108 urge the brake assembly 94 in a clockwise direction around the pivot 92 to urge the cam rollers 100 into contact with the top surfaces of the three holders 50. As the holders 50 are moved in the housing 20, the cam rollers 100 will roll on the top edges of the holders 50 and will drop into the cam recesses 80 when the holders 50 are fully extended relative to the housing 20. When the cam rollers 100 drop into the cam recesses 80, the brake assembly 94 is pivoted clockwise by the springs 108 which will urge the braking member or block 118 against the applicator roller 42 to stop rotation of said applicator roller. All three cam rollers 100 must drop into all three cam recesses 80 in order for the brake to be applied. This will prevent false braking caused by one or two slide holders becoming extended as when the tape 16 is being applied around a corner or around a shoulder, such as between the tread and a side wall of a tire.

Industrial Applicability

Referring to FIG. 1, a tape 16 is fed around the transposition roller 32 and threaded between the feeler roller 48 and the applicator roller 42 with the end of the tape 16 hanging freely from the applicator roller 42. Since

the tape-applying apparatus 10 is in the retracted position relative to the cross slide assembly 12, the holders 50 and 52 are in the fully forward position with the stop lugs 78 and 82 bearing against the end of the top plate 43 and the stitching rollers 72 and 74 are spaced from the body 15. The cam rollers 100 are seated in the cam recesses 80 and the brake assembly 94 is pivoted clockwise with the braking member or block 118 bearing against the applicator roller 42 to prevent rotation of the applicator roller 42. To apply tape 16 to the body 15, the fluid actuator 21 on the cross slide assembly 12 is activated to move the actuator rod 24 and tape-applying apparatus 10 forward to contact the stitching rollers 72 and 74 with the body 15. As the actuator rod 24 is moved outward of the cylinder 22, the spring 28 is compressed between piston 23 and end wall 25. Once the stitching rollers 72,74 contact the body 15, the slide holders 50 and 52 will remain stationary with respect to the body 15 as the housing 20 continues to move toward the body 15 which will roll the cam rollers 100 out of the cam recesses 80 to pivot the brake assembly 94 in a counterclockwise direction and release the braking member or block 118 from the surface of the applicator roller 42. The ends of the springs 66, pinned by pins 84 to the housing 20, will move relative to the holders 50,52 to stretch the springs 66 to spring load the stitching rollers 72,74 against the body 15. Continued movement of the housing 20 toward the body 15 will engage the free end of the tape 16 and the applicator roller 42 against the body 15, to tack the tape 16 to the body 15. Rotation of the body 15 in a counterclockwise direction will pull the tape 16 from the applicator roller 42 to between the stitching rollers 72 and 74 and the body 15. The stitching rollers 72,74 will stitch the tape 16 to the body 15. The applicator roller 42 will remain in contact with the body 15 to feed the tape 16 to the body 15, which tape 16 is then tacked and stitched by the stitching rollers 72 and 74.

When the desired thickness of the layer of tape has been added to the body 15, a cammed signal from the controls will exhaust the fluid from cylinder 22 through exhaust outlet 29, whereupon the spring 28 will drive the piston 23, rod 24 and housing 20 of the tape-applying apparatus 10 away from the body 15 to separate the applicator roller 42 from the body 15. When the housing 20 has retracted from the body 15 a predetermined amount, the cam rollers 100 will drop into the cam recesses 80 in the holders 50 whereupon the springs 108 will pivot the brake assembly 94 in a clockwise direction to apply the braking member or block 118 against the applicator roller 42 to stop further rotation of the applicator roller 42. Since the stitching rollers 72 on the holders 50 are still in contact with the body 15, they will continue to stitch the tape 16 to the continually rotating body 15, but, since the applicator roller 42 is not rotating, no material is being fed from the applicator roller 42, so that the tape 16 will be stretched and will be severed between the stitching rollers 72 and the applicator roller 42. The one free end of the tape 16 will remain draped over the applicator head ready for the next application and the other free end of the tape 16 will be stitched to the body 15 by the stitching rollers 72. The controls will command retraction of the tape-applying apparatus 10 from the body 15 by the support arm 14 which will move the tape-applying apparatus 10 to the condition of FIG. 1, wherein the apparatus is again ready to be moved forward into contact with the same

or a different body for application of another layer of tape thereto.

In one modified form of the invention, when the layer of tape 16 has been built up to a desired thickness, all drives are stopped. The controls will then command outlet 29 to exhaust the fluid from the cylinder 22 so that the spring 28 will retract the housing 20 and applicator roller 42 from contact with the body 15. The springs 66 will retain the stitching rollers 72,74 in contact with the body 15. At a predetermined point, the cam rollers 100 will engage in cam recesses 80 to apply the braking member or block 118 to the applicator roller 42 to prevent further rotation of the applicator roller 42. The controls will command a small amount of rotation to the body 15 which will stretch the tape 16 between the stitching rollers 72 and the applicator roller 42 until the tape 16 severs therebetween with the one free end of the tape 16 draping over the applicator roller 42 ready for the next application to a body 15 and with the other free end of the tape 16 being stitched to the rotating body 15 by the stitching rollers 72.

Other aspects, objects and advantages of this invention can be obtained from a study of the drawings, the disclosure and the appended claims.

I claim:

1. A method of applying and stitching a tape (16) onto a body (15) comprising the steps of supplying a tape (16) to an applicator roller (42) in contact with the moving body (15), stitching said tape (16) to said body (15) by passing stitching rollers (72) over said tape (16) in contact with said body (15), stopping rotation of the body (15) upon completion of the buildup of the layer of tape (16) on the body (15), retracting the applicator roller (42) from the body (15) while substantially simultaneously, applying a brake (94) to the applicator roller (42) to stop advancing said tape (16) to the body (15), moving said body (15) that is still in contact with the stitching rollers (72) to stretch the tape (16) between the braked applicator roller (42) and the stitching rollers (72) until said tape breaks somewhere between said applicator roller and said stitching rollers.

2. A method of applying and stitching a tape (16) onto a body (15) comprising the steps of feeding a tape (16) to an applicator roller (42) in contact with the moving body (15), stitching said tape (16) to said body (15) by passing at least one stitching roller (72) over said tape (16) in contact with said body (15), retracting the applicator roller (42) from the body (15) upon completion of the buildup of the tape (16) on the body (15) and substantially simultaneously, stopping the rotation of the applicator roller (42), continuing movement of said body (15) that is still in contact with the stitching roller (72) to stretch the tape (16) between the applicator roller (42) and the stitching roller (72) until said tape breaks.

3. A method of applying and stitching a tape (16) onto a body (15), and then severing said tape from said body (15), comprising the steps of feeding a tape (16) to an applicator roller (42) in contact with the moving body (15), stitching said tape (16) to said body (15) by passing at least one stitching roller (72) over said tape (16) in contact with said body (15), retracting the applicator roller (42) from the body (15) upon completion of the buildup of tape (16) on the body (15), applying a brake (94) to the applicator roller in response to retraction of the applicator roller (42) to stop feeding said tape (16) to the body (15), continuing the movement of said body (15) that is still in contact with the stitching roller (72)

to stretch said tape (16) between the applicator roller (42) and the stitching roller (72) until said tape breaks.

4. A method as claimed in claim 3 wherein a plurality of stitching rollers (72) stitch said tape (16) to said body (15).

5. A method as claimed in claim 3 wherein said tape (16) is initially draped over said applicator roller (42) with a free end of the tape hanging down therefrom, the steps include moving said applicator roller (42) toward said moving body (15) to release said brake (94) and to

contact said free end of the tape with said moving body (15).

6. A method as claimed in claim 5 wherein after said tape breaks the free end of the tape (16) is again hanging down from the applicator roller (42) and said at least one stitching roller (72) and the applicator roller (42) are retracted from the moving body (15) ready for the next application.

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